

What is Claimed is:

1. A gasket assembly for placement between the periphery of the face of a fuel cell stack and a manifold, said gasket assembly having one or more of: different compressibilities over predetermined portions of said gasket assembly; and a resilient shim disposed within preselected
5 sections of said gasket assembly.
2. A gasket assembly according to claim 1, wherein the face of said fuel cell stack has opposing first and second periphery portions formed by portions of the end faces of the end plates of the fuel cell stack and opposing third and fourth periphery portions formed by end portions of the end faces of the bipolar plates of the fuel cells of the fuel cell stack, said third and
10 fourth periphery portions expanding to a greater degree than said first and second periphery portions due to said bipolar plates expanding to a greater degree than said end plates, and wherein said gasket assembly has said different compressibilities over predetermined portions of said gasket assembly and includes a member having said predetermined portions of said gasket assembly, said member having first and second portions adapted to face said first and second
15 periphery portions of said face of said fuel cell stack and third and fourth portions adapted to face said third and fourth periphery portions of said face of said fuel cell stack, said first and second portions of said member being of lower compressibility than said third and fourth portions of said member.
3. A gasket assembly according to claim 2, wherein each of said first, second, third and
20 fourth portions of said member are formed by layers of a fibrous material.
4. A gasket assembly according to claim 3, wherein said fibrous material is zirconia felt.
5. A gasket assembly according to claim 3, wherein said layers of said first and second portions of said member are filled with a material so as to cause said first and second portions of said member to be of lower compressibility than said third and fourth portions of said member.

6. A gasket assembly according to claim 5, wherein said first and second portions of said member are compressible up to approximately 30-60 % of the original thickness of said first and second portions and said third and fourth portions of said member are compressible up to approximately 50-80% of the original thickness of said third and fourth portions.

7. A gasket assembly in accordance with claim 6, wherein the original thickness of each of said first and second portions of said member is 0.208-0.308 inches and the original thickness of each of said third and fourth portions of said member is 0.208-0.308 inches.

8. A gasket assembly according to claim 5, wherein said material is silica powder.

9. A gasket assembly according to claim 2, wherein said gasket assembly has said resilient shim, parts of said resilient shim being embedded in said first and second portions of said member.

10. A gasket assembly according to claim 9, wherein said resilient shim includes sections along said resilient shim which provide said resiliency to said resilient shim.

11. A gasket assembly according claim 10, wherein each of said sections of said shim extends outward of the plane of said resilient shim.

12. A gasket assembly according to claim 11, wherein said resilient shim has a flat body and said sections of said resilient shim are cut from said flat body so that each of said sections of said resilient shim is connected to said flat body along one side of that section.

13. A gasket according to claim 12, wherein said sections of said resilient shim are spaced along the length of said flat body and the one side of each of said sections of said resilient shim is on the same side of each of said sections of said resilient shim.

14. A gasket assembly according to claim 12, wherein each of said sections of said resilient shim is disposed at an angle θ from said flat body and provide compliance to said resilience shim.

15. A gasket assembly in accordance with claim 11, further comprising an outer wrap enclosing said resilient shim.

16. A gasket assembly according to claim 15, wherein said outer wrap is closed only on one side of said resilient shim.

5 17. A gasket assembly according to claim 16, wherein said one side of said resilient shim is the side adapted to face inward of said fuel cell stack.

18. A gasket assembly according to claim 15, wherein said resilient shim and said outer wrap comprise a metallic material.

19. A gasket assembly according to claim 9, wherein the ends of the third and fourth
10 portions of said member are adapted to face said first and second periphery portions of said face of said stack, and parts of said resilient shim are embedded in said ends of said third and fourth portions of said member.

20. A gasket assembly according to claim 19, wherein each of said first, second, third and fourth portions of said member are formed by layers of a fibrous elastic material, and the parts of
15 said resilient shim embedded in said first and second portions of said member are disposed between the layers of fibrous elastic material of said first and second portions and the parts of said shim embedded in said ends of said third and fourth portions of said members are disposed between the layers of fibrous elastic material of said third and fourth portions.

21. A gasket assembly according to claim 20, wherein said layers of said first and second
20 portions of said member are filled with a material so as to cause said first and second portions of said member to be of lower compressibility than said third and fourth portions of said member.

22. A gasket assembly according to claim 21, wherein said first and second portions of said member are compressible up to approximately 30-60% of the original thickness of said first and

second portions and said third and fourth portions of said member are compressible up to approximately 50-80% of the original thickness of said third and fourth portions.

23. A gasket assembly in accordance with claim 22, wherein the original thickness of each of said first and second portions of said member is 0.208-0.308 inches and the original thickness of each of said third and fourth portions of said member is 0.208-0.308 inches.

24. A gasket assembly according to claim 21, wherein said material is silica powder.

25. A gasket assembly according to claim 21, wherein said resilient shim includes sections along said resilient shim which provide said resiliency to said shim.

26. A gasket assembly according claim 25, wherein each of said sections of said resilient shim extends outward of the plane of said resilient shim.

27. A gasket assembly according to claim 26, wherein said resilient shim has a flat body and said sections of said resilient shim are cut from said flat body so that each of said sections of said resilient shim is connected to said flat body along one side of that section.

28. A gasket assembly according to claim 27, wherein said sections of said resilient shim are spaced along the length of said flat body and the one side of each of said sections of said resilient shim is on the same side of each of said sections of said resilient shim.

29. A gasket assembly according to claim 28, wherein each of said sections of said resilient shim is disposed at an angle θ relative to said flat body and provides compliance to said resilient shim.

30. A gasket assembly according to claim 26, further comprising an outer wrap enclosing said resilient shim.

31. A gasket assembly according to claim 30, wherein said wrap is closed only on one side of said resilient shim.

32. A gasket assembly according to claim 31, wherein said one side of said resilient shim is the side adapted to face inward of said fuel cell stack.

33. A gasket assembly according to claim 30, wherein said resilient shim and said outer wrap comprise a metallic material.

5 34. A gasket assembly in accordance with claim 1, wherein said gasket assembly includes a member and said resilient shim is embedded in said member.

35. A gasket assembly according to claim 34, wherein said resilient shim includes sections along said resilient shim which provide said resiliency to said resilient shim.

36. A gasket assembly according claim 35, wherein each of said sections of said resilient
10 shim extends outward of the plane of said resilient shim.

37. A gasket assembly according to claim 36, wherein said resilient shim has a flat body and said sections of said resilient are cut from said flat body so that each of said sections of said resilient shim is connected to said flat body along one side of that section.

38. A gasket assembly according to claim 37, wherein said sections of said resilient shim is
15 spaced along the length of said flat body and the one side of each of said sections of said resilient shim is on the same side of each of said sections of said resilient shim.

39. A gasket assembly according to claim 38, wherein each said sections of said resilient shim is disposed at an angle θ relative to said flat body and provide compliance to said resilience shim.

20 40. A gasket assembly according to claim 36, further comprising an outer wrap enclosing said resilient shim.

41. A gasket assembly according to claim 40, wherein said outer wrap is closed only on one side of said resilient shim.

42. A gasket assembly according to claim 41, wherein said one side of said resilient shim is the side adapted to face inward of said fuel cell stack.

43. A gasket assembly according to claim 40, wherein said resilient shim and said outer wrap comprise a metallic material.

5 44. A fuel cell stack assembly comprising:

a fuel cell stack including: end plates at opposite ends of said stack; a plurality of fuel cells stacked one against the other between said end plates; and said fuel cells and said end plates defining at least one face for said fuel cell stack;

a manifold adjacent said one face of said fuel cell stack; and

10 a gasket assembly for placement between the periphery of said face of a fuel cell stack and said manifold, said gasket assembly having one or more of: different compressibilities over predetermined portions of said gasket assembly; and a resilient shim disposed within preselected sections of said gasket assembly.

45. A fuel cell stack assembly according to claim 44, wherein the face of said fuel cell stack
15 has opposing first and second periphery portions formed by portions of the end faces of the end plates of the fuel cell stack and opposing third and fourth periphery portions formed by end portions of the end faces of bipolar plates of the fuel cells of the fuel cell stack, said third and fourth periphery portions expanding to a greater degree than said first and second periphery portions due to said bipolar plates expanding to a greater degree than said end plates, and
20 wherein said gasket assembly has said different compressibilities over predetermined portions of said gasket assembly and includes a member having said predetermined portions of said gasket assembly, said member having first and second portions adapted to face said first and second periphery portions of said face of said fuel cell stack and third and fourth portions adapted to face said third and fourth periphery portions of said face of said fuel cell stack, said first and

second portions of said member being of lower compressibility than said third and fourth portions of said member.

46. A fuel cell stack assembly according to claim 45, wherein each of said first, second, third and fourth portions of said member are formed by layers of a fibrous elastic material.

5 47. A fuel cell stack assembly according to claim 46, wherein said fibrous elastic material is zirconia felt.

48. A fuel cell stack assembly according to claim 46, wherein said layers of said first and second portions of said member are filled with a material so as to cause said first and second portions of said member to be of lower compressibility than said third and fourth portions of said member.

49. A fuel cell stack assembly according to claim 48, wherein said material is silica powder.

50. A fuel cell stack assembly according to claim 45, wherein said gasket assembly has said resilient shim, parts of said resilient shim being embedded in said first and second portions of said member.

15 51. A fuel cell stack assembly according to claim 50, wherein said resilient shim includes sections along said resilient shim which provide said resiliency to said resilient shim.

52. A fuel cell stack assembly according claim 51, wherein each of said sections of said resilient shim extends outward of the plane of said resilient shim.

53. A fuel cell stack assembly in accordance with claim 52, further comprising an outer wrap enclosing said resilient shim.

54. A fuel cell stack assembly according to claim 53, wherein said outer wrap is closed only on one side of said resilient shim.

55. A fuel cell stack assembly according to claim 54, wherein said one side of said resilient shim is the side adapted to face inward of said fuel cell stack.

56. A fuel cell stack assembly according to claim 50, wherein the ends of the third and fourth portions of said member are adapted to face said first and second periphery portions of said face of said stack, and parts of said resilient shim are embedded in said ends of said third and fourth portions of said member.

5 57. A fuel cell stack assembly according to claim 56, wherein each of said first, second, third and fourth portions of said member are formed by layers of a fibrous elastic material, and the parts of said resilient shim embedded in said first and second portions of said member are disposed between the layers of fibrous elastic material of said first and second portions and the parts of said resilient shim embedded in said ends of said third and fourth portions of said
10 members are disposed between the layers of fibrous elastic material of said third and fourth portions.

58. A fuel cell stack assembly according to claim 57, wherein said layers of said first and second portions of said member are filled with a material so as to cause said first and second portions of said member to be of lower compressibility than said third and fourth portions of said
15 member.

59. A fuel cell stack assembly according to claim 58, wherein said material is silica powder.

60. A fuel cell stack assembly according to claim 58, wherein said resilient shim includes sections along said resilient shim which provide said resiliency to said resilient shim.

61. A fuel cell stack assembly according claim 58, wherein each of said sections of said
20 resilient shim extends outward of the plane of said resilient shim.

62. A fuel cell stack assembly according to claim 61, further comprising an outer wrap enclosing said resilient shim.

63. A fuel cell stack assembly according to claim 62, wherein said outer wrap is closed only on one side of said resilient shim.

64. A fuel cell stack assembly according to claim 63, wherein said one side of said resilient shim is the side adapted to face inward of said fuel cell stack.

65. A fuel cell stack assembly according to claim 62, wherein said resilient shim and said outer wrap comprise a metallic material.

5 66. A fuel cell stack assembly in accordance with claim 44, wherein said gasket assembly includes a member and said resilient shim is embedded in said member.

67. A fuel cell stack assembly according to claim 66, wherein said resilient shim includes sections along said resilient shim which provide said resiliency to said resilient shim.

68. A fuel cell stack assembly according claim 67, wherein each of said sections of said
10 resilient shim extends outward of the plane of said resilient shim.

69. A fuel cell stack assembly according to claim 68, further comprising an outer wrap enclosing said resilient shim.

70. A fuel cell stack assembly according to claim 69, wherein said outer wrap is closed only on one side of said resilient shim.

15 71. A fuel cell stack assembly according to claim 70, wherein said one side of said resilient shim is the side adapted to face inward of said fuel cell stack.

72. A fuel cell stack assembly according to claim 71, wherein said resilient shim and said outer wrap comprise a metallic material.